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# THE DUTCH ELM DISEASE

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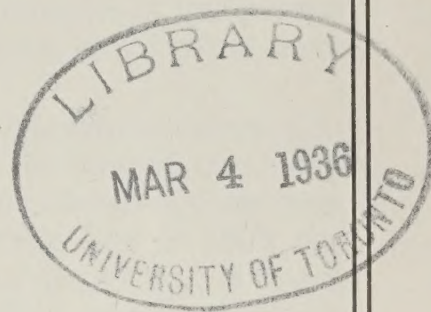
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# THE DUTCH ELM DISEASE

A. W. McCALLUM

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## Introduction

A destructive disease of elms caused by the fungus *Graphium ulmi* Schwarz has been discovered in the United States and while, at present, it is not known to occur in Canada, it may possibly be present without having been recognized. Consequently, this pamphlet has been prepared in order that those interested may have a knowledge of the symptoms of the disease and so be in a position to collect and send in material which in any way resembles it. Should the disease be found in this country it might be eradicated if it has not been present long enough to have spread and become firmly established. The importance of learning of its occurrence here at the earliest possible time is therefore apparent.

## Distribution

Dutch elm disease derives its name from the fact that it was first observed in Holland. This was in 1919 and since then it has been found in Belgium, France, Germany, Italy, Norway, and England. In these countries it has proved to be very destructive and, especially in Holland and Belgium, many trees have been killed by it.

The situation in the United States, which is of more immediate interest to Canada, is as follows: in 1930 three infected trees were discovered in Cleveland, Ohio, and one in Cincinnati, Ohio. In 1931 three more diseased trees were found in Cleveland. In 1932 no infected trees were observed but in 1933 one more diseased tree was located at Cleveland. All these were destroyed. A much more serious centre of infection was discovered in 1933 in New Jersey where, up until October 26, a total of 618 infected elms were located. In addition, forty-seven cases were found in New York and one each in Connecticut and Maryland. While prompt measures have been taken to destroy all diseased trees located, with the object of eradicating the fungus, the attainment of this purpose, in view of the extensive nature of the infection, is problematical.

In Canada during the past six years a good deal of scouting and examination of importations of nursery stock has failed to reveal the presence of the elm disease.

## Importance of Elms

There are three native species of elm in Canada—white elm (*Ulmus americana* L.), red elm (*Ulmus fulva* Michx.), and rock elm (*Ulmus racemosa* Thomas). The two latter are restricted in distribution, being confined to southern Ontario and Quebec. White elm, however, has a considerably wider range, extending from Cape Breton Island to central Saskatchewan, south of the height of land which divides the Great Lakes from Hudson Bay.

Two exotic species of elm—English elm (*Ulmus campestris* L.) and Scotch elm (*Ulmus glabra* Huds.)—have been used to a slight extent here as ornamentals.

It should be mentioned that all these species are susceptible to the elm disease, white elm being particularly so.





Figure 1.—A white elm infected with *Graphium ulmi*, the fungus causing Dutch elm disease. The leaves have mostly fallen from the branches on the left side and the disease is gradually involving the remainder of the tree.



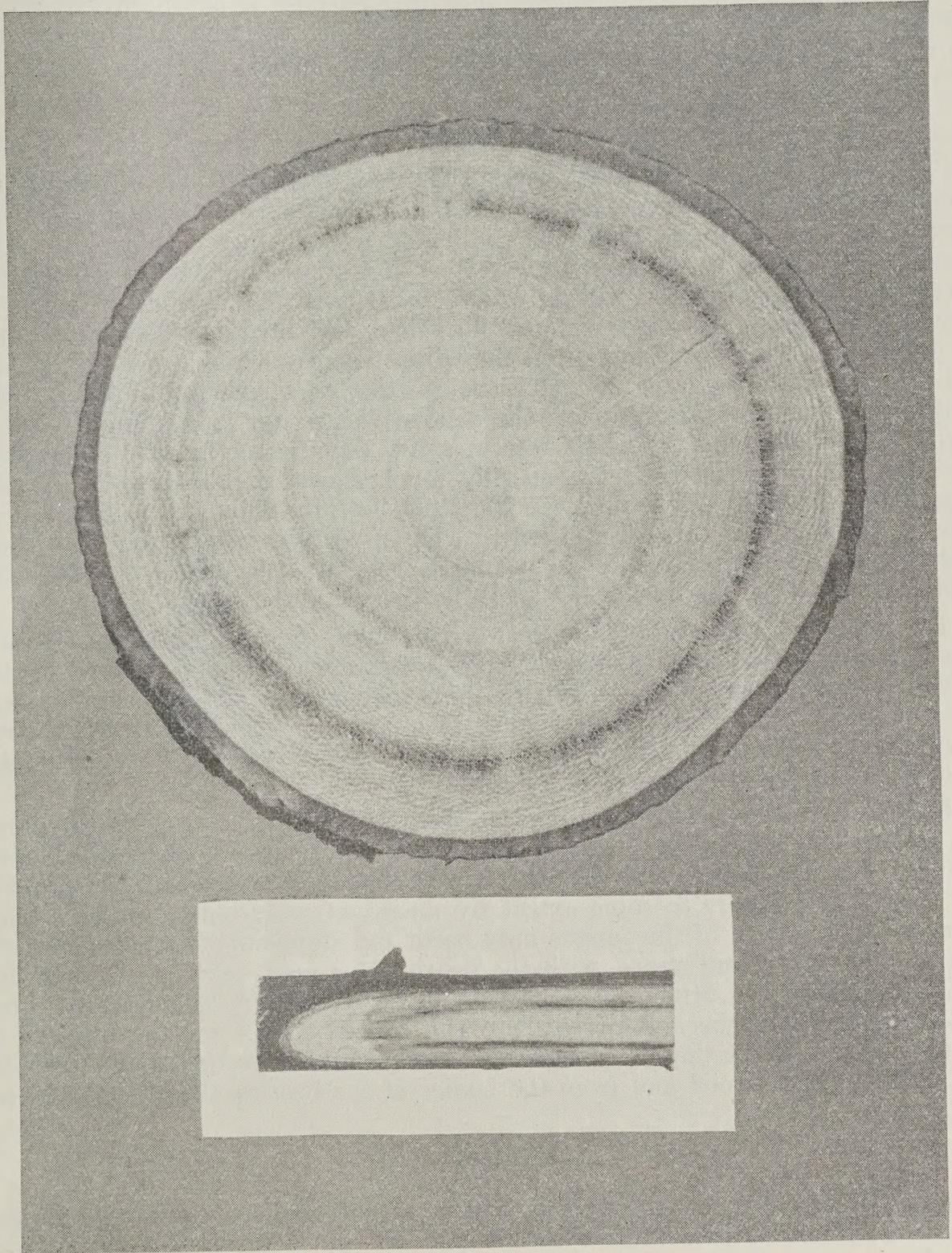


Figure 2.—Sections from diseased elm limbs showing (a) the brown ring in the sapwood in transverse section, and (b) the streaked appearance of the sapwood in longitudinal section.



Elms are commercially important in Canada and generally rank fourth among the hardwoods in regard to annual value production. Most of the elm cut is white elm and is produced in Ontario. Apart from its commercial significance, white elm is one of the most valuable ornamental trees. For planting on medium or wide streets it is the ideal species on account of its rapid growth, attractive form, and moderate shade. For this purpose it has been extensively used in many cities in Eastern Canada. Further, as an individual ornamental tree it is not surpassed by any other native, broad-leaved species.

### Symptoms

The most characteristic external symptom of Dutch elm disease is the sudden wilting of leaves, generally confined to one or more limbs at first, but at times, if the tree is small, involving the whole tree at once. (Fig. 1.\*) This usually occurs early in the growing season. The affected leaves as a rule turn yellow but occasionally the wilting occurs so rapidly that the green colour is retained. In either case they become shrivelled and brittle. Defoliation may take place soon afterwards but often the wilted leaves persist for a longer time than usual. The death of the tree, or of the part affected, follows these symptoms. The rate of progress of the disease varies, but in a young tree it is usually rapid, involving the whole tree in a few days from the first appearance of wilting; in a large tree it is generally much slower and several years may elapse before death finally occurs. In the latter case the foliage is thin and dead branches are scattered through the crown. Diseased trees often produce suckers along the main stem and at the bases of large branches. In winter affected trees are characterized by the downward hook-like curve of the twigs.

Internally in cross section the sapwood of infected trees generally shows a broken ring of brown dots, though sometimes a complete circle is formed by the discoloured tissue. (Fig. 2.\*) When the bark is removed and the sapwood cut longitudinally these discolorations appear as a series of brownish streaks, varying in number according to the severity of the infection. (Fig. 2.) Occasionally these symptoms are to be found in the roots.

European investigations have shown that the fungus is principally spread from tree to tree by means of spores adhering to the bodies of elm bark beetles (*Scolytus scolytus* Fabr. and *Scolytus multistriatus* Marsham). Presumably local spread also occurs to some extent by means of wind-borne spores. Long distance dissemination of the fungus may occur by shipment of infected nursery stock or logs. In recent years, with the death of so many elms in Europe due to the elm disease, an attempt has been made to utilize the killed trees. Logs from such trees have been imported into the United States for the purpose of making veneers. From these logs American investigators have isolated *Graphium ulmi*, both from the wood and from the bodies of the beetles already mentioned.

### Control

No effective means are known for treating an infected tree unless the disease is confined to one or two limbs which can be cut off. Once the main stem is affected nothing can be done to save the tree. To prevent the fungus from spreading to healthy trees it is necessary to destroy those already infected. Such extreme control measures are justifiable in a given area where the disease is not well established, and, if taken early enough, may result in the total elimination of the fungus.

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\* The photographs from which Figures 1 and 2 were prepared were supplied by the courtesy of the United States Department of Agriculture.



The importation of all species of elms and of elm logs into Canada is now prohibited by law, so that, if the fungus is not already present, the chances that it will be introduced are greatly decreased.

As it is not practicable to undertake an organized survey for a disease which may be non-existent, owners of elms and all others interested in the preservation of this species are urged to collect specimens which show symptoms similar to those of the Dutch elm disease. Such co-operation would be of the greatest value. Specimens should be short lengths—up to about ten inches—taken from small limbs—not over one inch in diameter—upon which the leaves are wilted or have recently died. Specimens from different trees should be kept separate. Parcels should be addressed to the Dominion Botanist, Central Experimental Farm, Ottawa, and, if not over one pound in weight, may be sent post free.

